WHAT IS CLAIMED IS:

1. A piezoelectric transducer, comprising:

a first piezoelectric ceramic layer;

a second piezoelectric ceramic layer laminated to the first piezoelectric layer;

a first electrodes set including a plurality of electrodes spaced along the first piezoelectric ceramic layer perpendicularly to a laminating direction of the first and second piezoelectric ceramic layers, the first electrodes set defining therebetween at least a first area polarized perpendicularly to the laminating direction; and

a second electrodes set including a plurality of electrodes positioned in the second piezoelectric ceramic layer in the laminating direction, the second electrodes set defining at least a second area polarized parallel to the laminating direction, the at least a second area being aligned in the laminating direction with the at least a first area, wherein upon application of a voltage to the first electrodes set and to the second electrodes set, an electric field is generated in the polarization direction in each of the at least a first area and the at least a second area to cause the at least a first area to extend by a longitudinal effect perpendicularly to the laminating direction and the at least a second area to contract by a transversal effect perpendicularly to the laminating direction.

2. The piezoelectric transducer according to claim 1, wherein the first piezoelectric ceramic layer includes a plurality of laminated first sheets, and the second piezoelectric ceramic layer includes a plurality of laminated second sheets, each electrode in the first electrodes set being sandwiched between adjacent first sheets, and each electrode in the second electrodes set being sandwiched between adjacent second sheets.

3. The piezoelectric transducer according to claim 1, wherein the first electrodes set includes a central electrode and two side electrodes, and the central electrode and the two side electrodes define two first areas, the two first areas placed symmetrically with respect to the central electrode and aligned with the at least a second area.

4. The piezoelectric transducer according to claim 3, wherein the two first areas are polarized in opposite directions symmetrically with respect to the central electrode.

5. The piezoelectric transducer according to claim 2, wherein the plurality of electrodes in the first electrodes set are sandwiched between adjacent first sheets in a staggered configuration.

6. The piezoelectric transducer according to claim 5, wherein the plurality of electrodes in the first electrodes set are also provided in the laminating direction, and first

electrodes provided in the laminating direction are sandwiched between adjacent first sheets and aligned with each other.

7. The piezoelectric transducer according to claim 2, wherein the piezoelectric transducer has an outer surface having a plurality of electric terminals and extending perpendicularly to a laminating direction of the first and second sheets, and a through-hole is formed through one or more sheets sandwiched, among the plurality of first and second sheets, between each electrode in the first and second electrodes sets and the outer surface, and each electrode is electrically connected to corresponding one of the plurality of electric terminals, via a conductive material filling the through-hole.

8. An ink ejector, comprising:

an ink channel forming member having partition walls that define ink channels filled with ink;

a nozzle connected to a corresponding one of the ink channels; and

a piezoelectric transducer extending across the ink channels, the piezoelectric transducer including:

a first piezoelectric ceramic layer;

a second piezoelectric ceramic layer laminated to the first piezoelectric layer;

a first electrodes set, for each ink channel, including a plurality of electrodes spaced along the first piezoelectric ceramic layer perpendicularly to a laminating direction of the first and second piezoelectric ceramic layers, the first electrodes set defining therebetween at least a first area polarized perpendicularly to the laminating direction; and

a second electrodes set, for each ink channel, including a plurality of electrodes positioned in the second piezoelectric ceramic layer in the laminating direction, the second electrodes set defining at least a second area polarized parallel to the laminating direction, the at least a second area being aligned in the laminating direction with the at least a first area, wherein the at least a first area in the first piezoelectric ceramic layer and the at least a second area in the second piezoelectric ceramic layer are aligned with each ink channel, and upon application of a voltage to electrodes, of the first and second electrodes sets, corresponding to a selected ink channel, an electric field is generated in the polarization direction in each of the at least a first area and the at least a second area, and the at least a first area extends by a longitudinal effect perpendicularly to the laminating direction and the at least a second area contracts by a transversal effect perpendicularly to the laminating

direction, thereby changing a volume of the selected ink channel to cause ink ejection from the nozzle of the selected ink channel.

9. The ink ejector according to claim 8, wherein the first piezoelectric ceramic layer includes a plurality of laminated first sheets, and the second piezoelectric ceramic layer includes a plurality of laminated second sheets, each electrode in the first electrodes set being sandwiched between adjacent first sheets, and each electrode in the second electrodes set being sandwiched between adjacent second sheets.

10. The ink ejector according to claim 8, wherein the first electrodes set includes a central electrode and two side electrodes, and the central electrode and the two side electrodes define two first areas, the two first areas and the at least a second area placed symmetrically with respect to a center of a corresponding ink channel.

11. The ink ejector according to claim 10, wherein the two first areas are polarized in opposite directions symmetrically with respect to the central electrode.

12. The ink ejector according to claim 9, wherein the plurality of electrodes in the first electrodes set are sandwiched between adjacent first sheets in a staggered configuration.

13. The ink ejector according to claim 12, wherein the plurality of electrodes in the first electrodes set are also provided in the laminating direction, and first electrodes provided in laminating direction are sandwiched between adjacent first sheets and aligned with each other.

14. The ink ejector according to claim 9, wherein the piezoelectric transducer has an outer surface having a plurality of electric terminals and extending perpendicularly to a laminating direction of the first and second sheets, and a through-hole is formed through one or more sheets sandwiched, among the plurality of first and second sheets, between each electrode in the first and second electrodes sets and the outer surface, and each electrode is electrically connected to corresponding one of the plurality of electric terminals, via a conductive material filling the through-hole.

15. The ink ejector according to claim 10, the two side electrodes of the first electrodes set are aligned with a corresponding two partition walls defining an ink channel.

16. The ink ejector according to claim 15, wherein one of the two side electrodes of the first electrodes set is commonly used as one of the two side electrodes in an adjacent first electrodes set, and the three side electrodes are aligned with a corresponding three partition walls that define two adjacent ink channels.

17. The ink ejector according to claim 8, wherein the second piezoelectric ceramic layer faces the ink channels while the first piezoelectric ceramic layer is placed at an opposite side of the second piezoelectric ceramic layer from the ink channels.

18. The ink ejector according to claim 8, wherein the piezoelectric transducer further includes an insulating sheet that covers the ink channels to insulate the first and second electrodes sets from the ink in the ink channels.

19. An ink ejector, comprising:

an ink channel forming member having partition walls that define ink channels;

a nozzle connected to a corresponding one of the ink channels; and

a piezoelectric transducer extending across the ink channels, the piezoelectric transducer including:

a first piezoelectric layer having, corresponding to each ink channel, a pattern of two spaced first electrodes aligned with two partition walls defining each ink channel and a second electrode centered over each ink channel; and

a second piezoelectric layer having, corresponding to each ink channel, a third electrode and a fourth electrode that extend over each ink channel, the first and second piezoelectric layers being laminated over the ink channels, wherein first areas defined between each of the first electrodes and the second electrode of each pattern are polarized perpendicular to the laminating direction, and a second area defined between the third and fourth electrodes is polarized parallel to the laminating direction, and upon application of a voltage to the first electrodes and the second electrode and to the third and fourth electrodes, an electric field is generated in the polarization direction in each of the first areas and in the second area, and each of the first areas extends perpendicularly to the laminating direction and the second area contracts perpendicularly to the laminating direction, thereby changing a volume of a corresponding ink channel.

20. The ink ejector according to claim 19, wherein the first piezoelectric layer includes a plurality of laminated first piezoelectric sheets, each having, for a pattern corresponding to each ink channel, at least one of the two spaced first electrodes and the second electrode, and the second piezoelectric layer includes a plurality of laminated second piezoelectric sheets, each having, corresponding to each ink channel, one of the third and fourth electrode.

21. The ink ejector according to claim 20, wherein the piezoelectric transducer further includes an additional sheet, and an outer surface of the additional sheet extends

perpendicularly to the laminating direction and has a plurality of electric terminals, and wherein a through-hole is formed through one or more sheets sandwiched, among the plurality of first and second sheets, between each of the first, second, third, and fourth electrodes and the outer surface, and each of the first, second, third, and fourth electrodes is electrically connected to corresponding one of the plurality of electric terminals, via a conductive material filling the through-hole.

22. An ink ejector, comprising:

a nozzle member having at least one nozzle and an ink channel between adjacent partition walls associated with each nozzle;

a first piezoelectric layer; and

a second piezoelectric layer lying between the nozzle member and the first piezoelectric layer, wherein the first piezoelectric layer has a first pattern of electrodes for each ink channel arranged perpendicularly to a laminating direction of the nozzle member, second piezoelectric layer, and first piezoelectric layer and the second piezoelectric layer has a second pattern of electrodes for each ink channel arranged parallel to the laminating direction.

23. The ink ejector according to claim 22, wherein the first piezoelectric layer comprises a first plurality of sheets and the second piezoelectric layer comprises a second plurality of sheets.

24. The ink ejector according to claim 23, wherein the first pattern of electrodes comprises two first electrodes and one second electrode, a first electrode aligned with each partition wall of the ink channel associated with each nozzle, and the second electrode aligned with the ink channel.

25. The ink ejector according to claim 24, wherein the first electrodes are on a first sheet of the first piezoelectric layer and the second electrode is on a second sheet.

26. The ink ejector according to claim 24, wherein the second pattern of electrodes comprises a third electrode on a first sheet of the second piezoelectric layer and a fourth electrode on a second sheet of the second piezoelectric layer.

27. The ink ejector according to claim 26, wherein the second, third and fourth electrodes are aligned with the ink channel.

28. The ink ejector according to claim 24, wherein the first piezoelectric layer is polarized in directions perpendicular to the laminating direction, the directions of polarization centered on the second electrode and toward the first electrodes.

29. The ink ejector according to claim 28, wherein the second piezoelectric layer is polarized in directions parallel to the laminating direction.

30. The ink ejector according to claim 24, wherein a top sheet of the first piezoelectric layer comprises a fifth electrode extending along one edge and a sixth electrode associated with each ink channel along an opposing edge, the first and second piezoelectric layers having a plurality of through-holes extending therethrough and filled with a conductive material, the fifth electrode electrically connected to the first and fourth electrodes by through-holes and the sixth electrode electrically connected to the second and third electrodes by through-holes.

31. The ink ejector according to claim 23, wherein a bottom sheet of the first piezoelectric layer is a top sheet of the second piezoelectric layer.

32. The ink ejector according to claim 23, wherein a bottom sheet of the second piezoelectric layer is attached to the nozzle member.

33. The ink ejector according to claim 32, wherein the nozzle member comprises:

a nozzle plate having a plurality of nozzles that comprise the at least one nozzle;

a spacer member mounted to the nozzle plate and having a connecting hole aligned with each nozzle; and

an ink channel forming member mounted to the spacer member, the ink channel member having the ink channel between adjacent partition walls associated with each nozzle.

34. The ink ejector according to claim 30, wherein when a positive electric charge is applied to the sixth electrode, and thence to the second and third electrodes and a negative charge is applied to the fifth electrode, and thence to the first and fourth electrodes, resultant electric fields cause the first piezoelectric layer to expand by a longitudinal effect perpendicularly to the laminating direction and the second piezoelectric layer to contract by a transversal effect perpendicularly to the laminating direction.